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TANGANYIKA TERRITORY.

DEPARTMENT OF AGRICULTURE

Annual Report

1928/29.

PART II.

DAR ES SALAAM
PRINTED BY THE GOVERNMENT PRINTER.
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PART II.—AGRICULTURAL INVESTIGATION.

Reports on:—

Morogoro Agricultural Station.
Mpanganya Agricultural Station.
Ibadakuli Agricultural Station.
Botanic Gardens, Dar es Salaam.
Entomological Work.
Mycological Work.

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DEPARTMENT OF AGRICULTURE.

REPORT FOR 1928/29.

For convenience this Report is now divided into two parts: Part I dealing with Agricultural Administration and Progress, and Part II, which follows, the Agricultural Investigation that has been carried out during the period.

MOROGORO AGRICULTURAL STATION.

The following paragraphs contain an account of the experiments with annual crops carried out on the Morogoro Agricultural Station. The work has been a continuation of the experiments of previous years. The rainfall during the season was normal.

2. *Cotton Variety Trials.*—Only seven varieties were included in this experiment in 1928. Of the fourteen tried in 1927 the following were discarded as having proved unsuited to local conditions, Griffin, Improved Bancroft, R.M. 53, Watts Long Staple, R.M. 90, Webber 49 and King. The seven varieties remaining in the experiment were sown on 23rd February, 1928, all receiving identical treatment throughout the season. A summary of the results obtained with these is given below:—

Variety	Yield per acre in lb. of seed-cotton, 1928	Comparative Yield			
		1925	1926	1927	1928
Local (Uganda origin) ...	592	100	100	100	100
M-Selection	400	—	—	75	67
Foster X Whitehall	581	—	—	74	97
R.M. 68	517	—	78	61	87
N. 17	499	—	—	44	84
Rustenburg O	473	—	—	40	79
Over the top	521	128	75	88	88

3. In all cases the seed used was produced on the Station in 1927 in isolation plots. It will be noted that in the cases of the varieties Foster x Whitehall, R.M. 68, N. 17 and Rustenburg O this seed has given a higher comparative yield than that obtained in 1927 with the imported seed. The local strain of Uganda continues to give the highest yields, and no variety has shown such outstanding merit that multiplication of seed with a view to general distribution would be justifiable. The

product of price and yield is the ultimate index of the value of a variety. The Liverpool brokers' valuations of the samples of seed cotton sent for examination to the Imperial Institute in 1927 indicate that R.M. 68 and Foster x Whitehall are the only two varieties in the experiment which appear at all likely to challenge the premier position of the local cotton. The experiment is being continued to ascertain whether the comparative yields of these will be maintained or possibly increase. Purity of seed is maintained from season to season by growing an isolated plot of each variety and discarding all seed from the actual trial plots.

4. *Cotton: Time of Sowing Experiment, 1928.*—In this trial two tenth-acre plots were planted at intervals of one week from 9th February to 22nd March. A summary of yields together with the weekly rainfall for the period prior to planting is given below:—

Date of Planting	Average Plot yield in Kgs.	Acre yield in Kgs.	Comparative yield.	Rainfall in Millimetres
9.2.28	40.2	402	99	Nil
16.2.28	40.5	405	100	8.9
23.2.28	35.9	359	88	35.7
2.3.28	24.0	240	59	26.5
8.3.28	19.2	192	47	29.1
15.3.28	3.0	30	7	10.3
22.3.28	15.4	154	37	Nil
31.3.28	no planting	—	—	23.5

5. Below is given a summary of this experiment in previous years:—

Date of Planting	Rainfall during Month in mm.					Comparative yield				
	Month	1924	1925	1926	1927	192	1924	1925	1926	1927	1928
February 1st							—	—	—	67	—
February 9	Feb:	261	118	46	4	57	100	100	—	—	99
„ 16							—	—	—	83	100
„ 23							82	85	83	80	88
March 3	March	153	43	196	187	77	—	—	94	79	59
„ 8							26	62	100	100	47
„ 15							—	—	91	—	7
„ 22							9	0	86	85	37
„ 30	April	207	61	181	191	215	—	—	83	—	—
April 6	May	77	41	62	44	128	—	—	60	17	—

The above experiments demonstrate the soundness of planting as soon as the rains commence. In each year the highest yields are given by the earliest planting after the rains have begun, and in cases where rain is unduly late it appears sound to dry-plant in the latter half of February.

6. *Cotton: Distance of Sowing Experiment.*—As in the preceding years all the plots were sown on the same day in rows 3 feet apart, the distances between the plants varying from 6 inches by intervals of 3 inches and 6 inches up to 30 inches. The following results were obtained this season:—

Distance of Planting	Number of plants to a hill	Acre yields in kgs. seed-cotton	Comparative yields
3′ × 6″	1	405	100
3′ × 9″	1	392	96
3′ × 12″	1	313	77
3′ × 18″	2	335	82
3′ × 26″	2	347	85
3′ × 30″	2	256	63

7. An analysis of the results obtained in this experiment over a number of years is given below:—

Distance of Planting	Comparative Yield					
	1923	1924	1925	1926	1927	1928
6 inches apart	—	—	—	100	100	100
9 „ „	100	100	44	—	100	96
12 „ „	—	—	81	93	94	77
15 „ „	91	75	73	—	—	—
18 „ „	78	70	100	75	99	82
24 „ „	75	43	—	85	68	85
30 „ „	—	—	—	84	64	63

In forming conclusions from the above table the following points should be noted:—

(a) In 1923, 1924 and 1925 the plants were thinned out to only one plant per hill.

(b) In 1926, 1927 and 1928 the plants were thinned out to one plant per hill in the 6, 9 and 12 inch spacings, but two plants were left in the 18, 24 and 30 inch spacings.

(c) 1925 was an abnormally dry season, which accounts for the wider spacing giving higher comparative yields.

(d) The number of plants per acre at each given planting distance is:

Distance of Plants	1 Plant per Hill	2 Plants per Hill
6 inches	29,040	—
9 „	19,360	—
12 „	14,520	—
15 „	11,616	—
18 „	9,680	19,360
24 „	7,260	14,520
30 „	5,808	11,616

8. These results tempt one to the conclusion that there is little practical difference in yield with single planting at 6 and 9 inches or double planting at 18 inches, but that the difference is in favour of single planting at the closer spacing. Going a step further it might be inferred that the highest yield is obtained when there are 19,360 to 29,040 plants per acre; and that with spacings giving less than 19,000 plants per acre yield in a normal season declines in direct proportion to the fewer plants per acre. It has not been demonstrated that more than 29,040 plants per acre will give a lower yield. In 1923 to 1925 nine inches was the closest spacing and owing to the results obtained a six-inch spacing was included in the experiment in subsequent years.

9. From theoretical considerations it is sound to assume that the more evenly a given number of plants is distributed over a given area the better chance of development has the individual plant. Thus a spacing with single plants per hill is theoretically better than a spacing with two plants to a hill where both spacings give the same number of plants per acre. This is demonstrated in the above results. Practical considerations, such as weeding and cultivating, make it undesirable that the rows should be closer than 2 feet apart. The problem now resolves itself into a simple calculation as to what spacing in rows 2 feet apart will give 29,040 plants per acre. This works out at 9 inches apart. Thus combining theory with the field observations above, it would appear that a spacing with rows 2 feet apart and single plants left 9 inches apart in the rows would give the best results.

10. The above remarks are not conclusions as the evidence is insufficient. The experiment is being continued to either refute or corroborate the suggestion put forward. It should further be noted that any quantitative conclusions drawn from this experiment would apply only to cotton grown under conditions of soil and climate similar to those on this station.

11. *Beans: Variety trials.*—The crops grown in this trial were:—

(a) Native green seed gram *(Phaseolus Mungo).*
(b) Tepary beans.
(c) Native Lima beans *(P. lunatus).*
(d) Black gram *(P. radiatus).*

First planting, 28th October, 1927:—

This attempt to grow quick-maturing legumes in the short rains was a complete failure. Germination with the early November rains was good. Then followed three weeks of dry weather. This completely killed the local beans. The tepary beans and the two varieties of gram suffered to a lesser but severe extent. At the end of November a few showers of rain fell, and seed was supplied to fill in the stands in each plot. It was not until 15th December that the short rains really commenced and for a fortnight good rain fell, but it was too late to save the crop. The dry spell of January put the finishing touches to what was already a failure. On 10th February, 1928, all ripe seed was harvested and the plots were hoed up for replanting. The rainfall during the trial was as under:—

	mm.		mm.		mm.
November 1	18.1	December 6	1.2	January 1	3.8
2	5.0	7	0.3	9	1.8
4	5.1	12	6.5	10	0.9
23	0.1	15	36.7	11	0.1
27	3.7	18	7.0	27	1.3
28	0.5	20	50.0		
29	0.5	21	35.2		
30	1.1	22	7.9		
		23	3.1		
		24	1.2		
		25	0.3		
		27	0.8		

Second planting, 28th November, 1927:—
This second planting fared little better than the first. The dry weather in January checked growth and the yields recorded are practically none.

Third planting, 20th February, 1928:—
A third attempt was made to obtain comparative yields. Germination was good and the crop made good growth until an epidemic of beetles *(Ootheca bennigensi)* appeared and the plants were defoliated. Dusting with calcium arsenate was carried out under the advice of the Entomologist. Owing to continuous rain at this period the dust was washed from leaves and the poison had little effect in checking the insects. It was noted that the black gram resisted the attacks of the beetle more than the other crops. This was probably due to its hairy leaves. All crops suffered very severely and no yields were obtained.

Fourth planting, 2nd April, 1928:—
A fourth and final planting was attempted. Germination was good. The beetles, however, completely defoliated the plants. The only seed harvested was from the black gram, and this only in very small quantity: **7 kilogrammes per acre.**

12. *Sorghum Variety Trials.*—The sorghums have been divided into three types, and the object of the experiment has been to find the most suitable varieties in each type. The types are:—

(a) Heavy yielding—with a hard grain suitable for storage or export.
(b) Heavy yielding—not necessarily suitable for storage or export. This class includes soft grained varieties.
(c) Early maturing.

The experiment has been conducted on these lines for three successive seasons. The details of the 1928 season are given below, together with a summary of those of the preceding years. The obviously inferior varieties included in the 1926 and 1927 experiments have been discarded.

Heavy-yielding Types.—All varieties were planted on 22nd December, 1927. This is the normal sorghum planting season. All the varieties suffered very severely from the six weeks' drought after planting. In practical farming the crop would be regarded as a failure, but the results are interesting as they give comparative yields under adverse conditions.

Variety	Yield per Acre in kgs.	Order of Yield
Bonganhilo	55	III
Kilinyali*	195	I
Ngwana Kwimba	85	II
Sukesha*	30	IV
Kihemba-hemba	15	V
Karachi*	15	VI

*Hand-grained varieties.

As the conditions of the first planting resulted in crop failure a second planting was carried out on 16th February, 1928, just at the commencement of the heavy rains. The following table gives the results together with the comparative yields of the varieties in this experiment over three years:—

Variety	Yield per acre in kgs., 1928	Comparative Yields.		
		1926	1927	1928
Bonganhilo	1,000	100	100	100
Kilinyali*	840	80	62	84
Ngwana Kwimba ...	540	67	54	54
Sukesha*	430	87	52	43
Kihemba-hemba ...	100	not grown	42	10
Karachi*	70	19	1	7
6 other varieties ...	Discarded in 1928	—	—	—

*Hard-grained varieties.

Early Maturing Types.—Thirteen varieties of quick-maturing dwarf sorghums imported from the Sudan and the United States of America were grown on the station. Dwarf sorghums have been imported and tried on this station since 1924 without success. The object of the importation has been to give an early source of food, if possible growing the crop during the short rains. Every attempt to grow these sorghums early in the season has resulted in failure. In seasons where the early rains have been scanty the sorghums have made such poor growth that the yields have been negligible; in seasons where the early rain has been adequate for growth, flowering and setting of seed has occurred at the opening of the heavy rains, with the result that the heads have not set or been so damaged by fungous diseases that no crop has been harvested. This season it was decided to try planting these quick-growing sorghums at different periods to see if economic yields could be obtained at any period. Three plantings were attempted, the first in the short rains (21st December), the second during the rains (20th February), and the third towards the end of the rains (5th April). All the yields have been so low that any attempt at giving a table of comparative yields would be misleading. Yields have ranged from nothing to a maximum of 110 kgs. per acre, and the grain harvested has not been perfectly sound. The futility of these yields is shown when compared to the yield obtained from the native variety Bonganhilo—1,000 kgs. per acre.

13. *Sorghums: Distance of Sowing Experiment.*—In this experiment 3 tenth-acre plots were planted with the variety Bonganhilo and 3 with the variety Kilinyali at each spacings, thus each series of the four different spacings were replicated six times. All plots were planted on 16th February. The rows were all three feet apart, except in the native method in which instance planting was not in rows. The results are given below:—

Distance of Planting	Var. Bonganhilo Var. Kilinyali						Average	Order of yield
	Plot yield in kilos Series							
	1.	2.	3.	4.	5.	6.		
6 inches apart	116.0	115.5	129.5	72.5	72.5	51.0	92.8	II
12 „ „	110.5	110.5	115.5	83.5	65.0	43.0	88.0	III
18 „ „	121.5	116.5	83.5	87.3	58.0	15.0	93.3	I
Native	93.5	100.0	72.5	91.0	54.0	8.0	82.5	IV

In calculating the average yield the last two plots in series 6 have been omitted as these plots at the end of a range were very severely damaged in a wind-storm.

Planting in rows three feet apart with the spacing in the rows eighteen inches gives approximately the same number of plants per acre as the native planting method. Although the above results are not conclusive they indicate that the native has arrived at the optimum planting distance by experience, but that by planting haphazard instead of in rows weeding is more difficult and lower yield results.

14. *Millet Variety Trials.*—In this experiment three millets were grown: two strains of proso millet *(Panicum miliaceum)*, one from Poona and the other from South Africa, and *P. frumentaceum*. These millets are very quick-growing and were introduced to provide a quick-growing crop in the drier parts of the Territory. A trial planting in December was a complete failure. The results of second planting on 21st February are given below:—

Variety	Days to Harvest.	Acre Yield in kgs.
Poona Proso	76	422
Station Proso	76	463
P. frumentaceum	91	508

While these millets would hardly be a useful addition to native food crops in this area of fairly high rainfall, it has been demonstrated that they are very quick-growing and produce a fair crop of grain. There is little to choose between the two strains of *P. miliaceum* either in yield or maturity. The grain of the Poona strain is more uniform and has a deeper and more pleasing colour and general appearance. The *P. frumentaceum* grain is hardly likely to be acceptable to natives as a food crop except in years of food shortage.

15. *Millets: Distance of Sowing Experiment.*—For this experiment seed of the Poona strain of proso millet *(P. millaceum)* was used. All plots were planted on 21st February, 1928. The results of the experiment are given below:—

Distance of Planting	Acre Yields in kgs.	Order of Yield.
Broadcast at 15 lb. per acre	370	II
„ „ 25 „ „	305	V
Sown in drills 6 inches apart	370	II
„ „ 12 „ „	410	I
„ „ 24 „ „	355	IV
„ „ 36 „ „	167	VI

This experiment was carried out in 1927, but the results were too conflicting to form any conclusions. It would appear that sowing in drills one foot apart gives the best results in Morogoro. This experiment to be of greatest value should be carried out under the conditions of the areas in which the seed is to be distributed.

16. *Maize Variety Trials.*— The growing of the two introduced varieties of maize Potchefstroom Pearl and White Cango alongside the local native maize was in the nature of a demonstration rather than an experiment. As the results of experiment with several varieties of maize in preceding years it had been decided to adopt the heavy yielding white dent, Potchefstroom Pearl, as the variety for distribution in areas of

good rainfall, and the quicker-matering more drought-resistant flint variety, White Cango, for distribution in drier parts. The table below gives the yields obtained in this demonstration. All plots were planted on 1st March, 1928:—

Variety	Yield per Acre in kgs.	Days from planting to harvest.	Days from planting to flowering
Potchefstroom Pearl	1,188	130	46
White Cango	1,101	115	39
Local Native	1,007	115	43

The following results obtained with Potchefstroom Pearl in a field where the crop was grown for the multiplication of seed are of value as giving yields under ordinary farm conditions rather than yield obtained in a comparative trial on small plots:—

Planted—19th February, 1928.
Harvested—3rd July, 1928.
Area of field—one acre.
Actual yield—1,056 kgs. of shelled grain. It should be noted that the yields reported are obtained at the Morogoro Experimental Station, which is not in a good maize area.

17. *Maize: Time of Sowing Experiment.*—In this experiment a departure has been made from the previous practice of a planting at definite weekly intervals. Planting was done at intervals of a week only if conditions were such as would give germination.

Date of Planting	Monthly Rainfall in mm. and number of rain-days			Yield	
	Month	mm.	Days	Kgs. per acre	Comparative
November 2 1927	Nov:	34	8	2	0
„ 22 „	—	—		1	0
„ 28 „	—	—		Nil	0
December 17 „	Dec:	150	12	Nil	0
January 1928	Jan:	8	5	No planting	0
February 20 „	Feb:	57	15	1,416	100
„ 27 „	—	—	(Commencing 15th)	1,031	73
March 5 „	March	77	9	1,065	75
„ 12 „	—	—	—	370	26
„ 19 „	—	—	—	217	15
„ 26 „	—	—	—	440	31
April 2 1928	April	215	18	270	20
„ 9 „	—	—	—	157	11
„ 16 „	—	—	—	82	6
„ 23 „	—	—	—	42	3

It will be noted that the highest yields are given over a planting period of fourteen days, from 20th February to 5th March. From a consideration of results it would appear that yield is dependent on early planting and rainfall. Provided rainfall is adequate early planting appears to give the best results. From a consideration of rainfall statistics for this area, adequate precipitation cannot be expected before the middle of February. It would appear that the safest planting time is with the first good rains after 15th February.

Previous experience. In the 1927 experiment the rainfall throughout the season was insufficient to mature a crop. In 1926 the first planting was done in April and this planting gave the highest yield; it was in consequence of this result that the experiment was planned to commence earlier in 1927 and 1928.

18. *Multiplication of Seed.*—While the primary function of this Station is crop experimentation, an important secondary function is the multiplication of seed for distribution. Seed is supplied from the Station to the tribal farms or sub-stations in the district, to natives and non-natives and to other Agricultural Stations throughout the Territory. A schedule in Part I of this Report shows the distribution of planting material during the year.

19. *Investigations with Plants.*—The nurseries of the Station continue to be used for raising plants of major or minor economic importance, and the propagation of fruit trees and ornamentals for distribution throughout the Territory. A beginning has been made to bring system and order into the block devoted to the medley of shrubs and trees planted during the German regime. This block (Block G) is being converted into an arboretum, in which trees of economic or botanic interest are being planted together in small lots. Plant and seed introductions other than those dealt with in the annual crop experiments are shown in the following table:—

Quantity introduced		Number of species represented
Plants	Seed packets	32
82	27	

The following are the results of trials with some of the more important plants during the year.

Hydnocarpus Wightiana. Seedlings were received from Kew during November, 1927, and a small consignment of seed from Malabar through the Leprosy Relief Association during July, 1928. Three of the seedlings from Kew were established in the Arboretum during April, 1928, and are growing well. The seed from Malabar took almost four months to germinate, but has come through quite satisfactorily.

Hydnocarpus anthelmintica. Seedlings of this species were also from Kew during November, 1927, and two consignments of seed through the Leprosy Relief Association. The germination of this seed as a whole was very unsatisfactory, although about 140 seedlings were raised.

Approximately thirty seedlings have been successfully established in the arboretum and are now an average height of 18 inches. A small block has also been established at Matombo sub-section.

Morus alba. Seedlings of three varieties of this mulberry, namely—*fructo roseo*, *fructo nigro*, and *murier blanc*, were raised in the nursery from seed imported from France. The germination in every case was good, and the resultant seedlings were handed over to the Entomologist for planting in connexion with the experiments in sericulture. The mulberries are now growing well in a permanent block.

Aleurites triloba, Candle-nut. A useful number of seedlings was raised from two lots of seed received. Twelve seedlings were planted in the arboretum during April, 1928. Replanting of a few of the young trees was necessary. From observations made during the first year the tree is a quick grower, and appears to flourish under Morogoro conditions.

Sterculia diversifolia, Kurrajong. Seeds were received during June, 1927, from Australia. Germination was good, and six of the seedlings were planted in the Arboretum during April, 1928. The tree is a moderately slow grower, and does not appear to be thriving well under local conditions.

Imported varieties of citrus plants from South Africa. Two consignments of citrus plants were received from South Africa (through Headquarters) during the year. On both occasions the percentage of losses was high, on account chiefly to the poor condition in which many of the plants arrived.

C. K. Latham,
District Agricultural Officer.

MPANGANYA AGRICULTURAL STATION.

20. The season was the poorest so far experienced, the rainfall being the lowest recorded, and also badly distributed so that it necessitated three to five resowings with many crops.

21. *Time of Sowing of Cotton Experiment.*—This experiment was carried out in duplicated 1/40-acre plots in both section A representing the light unflooded higher lands of the Rufiji valley, and section B representing the loams and "black cotton" soils of the valley lowlands which are liable to flooding. The following results were obtained:—

Plot No.	Time of Sowing	Monthly Rainfall mm.		Section A.			Section B.		
				Percentage Stand	Comparative Yield		Percentage Stand	Comparative Yield	
1	9.1.29	January	53.1	76	100	(I)	39	84	(IV)
2	23.1.29	February	51.9	24	44	(IV)	17	46	(IX)
3	6.2.29	March	116.8	35	62	(III)	34	73	(VII)
4	20.2.29	April	162.6	66	75	(II)	29	78	(V)
5	5.3.29	May	67.3	97	37	(V)	98	71	(VIII)
6	19.3.29	June	13.0	91	31	(VII)	79	77	(VI)
7	2.4.29	July	nil	89	34	(VI)	98	100	(I)
8	16.4.29	August	12.4	70	25	(VIII)	90	93	(II)
9	1.5.29	September	26.9	71	22	(IX)	90	88	(III)
10	15.5.29	October	2.6	nil	nil		nil	nil	

Correlation with previous years:—

Year	Optimum Date of Sowing		Yield of Seed-Cotton per Acre	
	Section A.	Section B.	Section A.	Section B.
			lb.	lb.
1922	March 5th ...	—	—	—
1923	March 1st ...	—	—	—
1924	March 24th ...	—	—	—
1925	March 3rd ...	—	1,136	—
1926	February 5th ...	January 8th	812	1,420
1927	January 22nd ...	January 22nd	692	1,050
1928	January 9th ...	April 2nd	422	360

Past experimentation has shown that the critical time in the life of the cotton plant is during the week following germination whether this takes place immediately after sowing or is delayed for some weeks. Given favourable rains to establish the young seedlings, the young plants quickly reach a stage of resistance to rainless periods and recovery after such periods is rapid when rain does fall, so that if sown early the crop is flowering before the end of the rains and maximum yield is assured by the heavy first picking of good-quality cotton which results. Early sowing is of especial importance with the light soils of section A, and in the series of this section the plots sown on 9th January and 20th

February alone received favourable rains over the critical periods Plots 2 and 5 suffered badly in this respect, as will be seen from the low percentage stands; the figures of percentage stand, that is the percentage of plants which mature, are a measure of the amount of increase which would be forthcoming by resowing, as would be made under commercial conditions of production. For example, the early sown plot No. 2 shows a percentage stand of 24, and it is obvious that the yield could be trebled by resowings, whereas with plot No. 5 the stand is 97 per cent. and the yield even lower than with plot No. 2, and it is equally apparent that little if any increase could be expected from resowing. This all accentuates the importance of sowing early whether there is rain or not; if this is done, resowings can be made and maximum yields obtained, whereas delay may result in losing the benefit of the early rains even though these be scanty. The optimum time of sowing depending so much on rainfall distribution as well as amount, no date can be prescribed as the optimum time for sowing; but the season's work has not only confirmed previous experimentation, but has enabled a more narrow period to be given for optimum sowing, namely from the last week in January to the end of February: cotton sown earlier in January may yield more heavily, as in Plot 1 section A, of the above series, but the quality is poor. With the plots sown from 5th March onwards, the rains over the critical period were favourable, but the later rains were not sufficient for profuse boll production.

With the corresponding plots of the lowland soils of section B, the results as in the 1926 season reflect the character of the soil. In that season a very heavy downpour caused early waterlogging of soil which promoted denitrification over the growing period which negatived any differences which might have occurred from sowing at different intervals.

To a less extent the observable differences in yield in 1928 are hidden under the levelling influence of lack of rain, the comparative differences in yield being much less than with section A. The silt soil of section B has great water-absorptive power, and heavy rain is necessary to bring such soil to the point where soil-water is freely available for plant growth, and also to produce a texture when the soil cracks are filled by expansion of the soil particles. Also such soils retain moisture to a greater degree than occurs in the light soils of section A, and hence the optimum period of sowing of cotton extends two months longer than with section A. Comparing plots Nos. 9 and 10 of section B, it will be seen that the yield drops from 88 per cent. to nothing, although there is only a fortnight between the sowings; this again proves the rule, which is all too often ignored by cotton growers, not to wait for rain to sow but to be prepared for it with cotton seed in the ground.

The low yields per acre as compared to those of previous years indicate the poor season for cotton general throughout the district. The unusually heavy rains of August and September were also harmful to the quality of the cotton harvested.

22. *Spacing of Cotton Experiment.*—A series of six plots at different spacings were sown in duplicate 1/40-acre plots in both sections A and

B. The results are given in the following table:—

Plot.	Spacing.	Comparative Yield Section A.	Comparative Yield Section B.
	ft. in.		
1	3 by 6	100	94
2	3 x 9	92	97
3	3 x 12	80	92
4	3 x 18	94	100
5	3 x 24	90	97
6	3 x 30	82	84

It is seen that no significance can be attached to the differences in yields of the above plots, except that taken as a whole there is evidence that the closer spacings give the best results especially in section A. The conditions of rainfall were so adverse that the plants were reduced to a struggle for existence which overshadows any differences in yield between plots of different treatments.

23. *Cotton Variety Trials.*—Seed of thirteen cotton varieties and eight Mp selections were sown in triple consecutive lines with ordinary district cotton as a control, to obtain comparative results per 100 plants; but owing to the failure of the rains and despite two resowings a very poor and uneven germination was obtained, which, combined with later damage by elephant, rendered the results of no value. Seed maintenance plots were also sown in both sections but these had no comparative value. One acre of J cotton was sown for further possible mass-multiplication.

24. *Ratooning of Cotton Experiment.*—The experimental cotton plots of 1927 were ratooned at the end of that season instead of being uprooted and burnt in the usual manner. The ratooned plots gave a yield of but 10lb. per acre. The results are correlated with those of previous years in the following table:—

Year	Yield per Acre of Seed-Cotton	
	Ratooned Cotton	Ordinary Cotton
	lb.	lb.
1926	433	733
1927	29	485
1928	10	183

The above results definitely rule out the ratooning of cotton as an economic possibility even to the farmer who may desire quantity irrespective of quality; also the method is not as cheap as first appears, it being necessary thoroughly to clean the land two or three times over the period from the end of the short rains to the early long rains. There is also the entomological viewpoint. In 1927 the incidence of insect pests with ratooned as compared to ordinary cotton was in the

proportion of 4:1 for cotton stainers, and 1½:1 for boll worm, while the equivalent figures for 1926 were 3:1 and 2:1 respectively. As regards the quality of lint, samples of ratooned and ordinary district cotton of the 1927 season were sent to the Imperial Institute for examination, the average length of fibre of the ordinary district cotton being 1·2 inch as compared to 1·12 inch of the ratooned cotton; the strength and lustre of the ratooned cotton were also inferior to those of the ordinary cotton; the commercial valuation by brokers in Liverpool priced the ordinary cotton at 12·80 pence and the ratooned cotton at 9·80 pence per lb. with "middling" American at 9·80 pence per lb.

25. *Economic Production of Cotton.* -Experimentation in 1923 and 1924 showed that an unusually deep preliminary digging gave no increase in yield over that of plots dug in a shallow manner, and last season this work was carried further. Plots were dug in the usual manner, while with a second series the tall grass and weed growth was merely cut down at the root immediately below the tufts from which tillering occurs. The grass was then raked into rows 3 feet apart, cotton being sown between these rows at the usual spacing of 3 feet by 18 inches and at the same time the control dug plots were sown. At the time of thinning a deep cultivation was given without disturbing the rotting grass between the rows of cotton which served as an effective mulch and subdued weed growth; the benefits of this neutralised any advantage which may have been given by the preliminary digging. There was no significant difference in yield between the two series, while the cotton sown on the carefully dug plots cost some twelve shillings per acre more than with the extensive method. To the cotton planter the benefit of omitting deep digging would be greater in that he can get a greater acreage sown during the optimum period that where intensive cultivation is first followed. A rule to be observed in following the above method is to cultivate and clean the land well after all sowings have been made.

26. *Rice Variety Trials.*—It is obvious that this Territory contains varieties of rice which in yield compare well with the rices of other lands. The average yield of paddy under native cultivation throughout the Rufiji District over the past four years is 1,536lb. per acre under an average rainfall of 816 millimetres, the yield in a good year of 1,980 millimetres in the Federated Malay States was 1,128lb. The greater part of the East African rice crops are also dependent on rainfall, temporary flooding of the land being a matter of chance over all but comparatively small areas, while in the Malay States controlled flooding is widely practised. Yet in the multitude of types to be found throughout the Territory there are many of little value often maintained in being only by a traditional sentiment. An example is Afa which was widely grown comparatively recently but is now a poor yielder with little resistance to drought, and with a conservatism common to farmers the world over is still grown by the older natives. Other types, while having both low yield and commercial value, are soft rices which cook well and have an appeal peculiar to localised areas; such are Kilowae, a soft rice popular to the Kikale region of the Eastern Rufiji, and also Kimoto. The trials conducted at the Mpanganya Station are designed with a view

to giving a basis of knowledge by which an improvement can be attained by elimination of the poorer types and substitution with more suitable kinds both as regards yield and market value.

The comparative results of the trials together with the order of yield for past years are given in the following table; these should be read in conjunction with the rainfalls of the different years which are 631mm. for 1928, 1,120mm. for 1927 and 746mm. for 1926: -

Variety.	Comparative Yield	Order of Yield.			Keeping Quality of Paddy.
		1928.	1927.	1926.	
Afiri (U.)	100	I	III	VII	F.
Mwanga (U.)	86	II	XVII	XII	G.
Bungala (U.)	84	III	XIV	—	VG.
Marula (U.)	82	IV	XV	III	F.
Hebu (U.)	79	V	XXI	XVI	P.
Africa (U.)	76	VI	III	II	F.
Ngowe (U.)	76	VI	VII	IV	G.
Meno Meupe (U.)	76	VI	XI	I	P.
Komamanga (U.)	72	IX	VI	VI	P.
Kilowae (U.)	71	X	XX	X	P.
Almeri Mgeni (U.)	70	XI	XI	VIII	VG.
Kichawachawa (U.)	65	XII	XIII	IX	P.
Kilimani (U.)	58	XIII	IX	V	VG.
Unyengwa (H.)	57	XIV	XVIII	XIII	G.
Ngukukuru (H.)	57	XIV	—	—	G.
Kanunge (L.)	57	XIV	II	—	P.
Pa D.C. (L.)	55	XVII	—	—	?
Borakupata(H.)	54	XVIII	—	—	G.
Bilgili (U.)	53	XIX	—	—	P.
Jegerenati (U.)	52	XX	VIII	XI	VG.
Maridadi (U.)	50	XXI	I	—	VG.
Stima (L.)	48	XXII	V	—	G.
Mpemba (L.)	38	XXIII	XIX	XIV	G.
Msamaki (L.)	28	XXIV	XV	—	VG.
Afa (L.)	22	XXV	IX	XVII	G.
Kimoto (L.)	14	XXVI	XXII	XV	G.

U. = Upland or dryland rice.
L. = Lowland or marsh-land type.
H. = Hill-land type.

P. = Poor.
F. = Fair.
G. = Good.
VG. = Very good.

With the exception of variety Pa D.C. which had been received through Headquarters from Sierra Leone the whole of the above varieties of rice were obtained from native cultivations in the Rufiji. A feature further indicating the need of re-organisation of the cultivation of rice in this district is the low yield of the lowland varieties even in the year 1927 of record high rainfall, the poorest of these types being Mpemba, Stima, Msamaki, Afa and Kimoto. The comparative low places in yield of the hill-land varieties Unyengwa, to which so much importance is attached, Borakupata and Ngukukuru, seem to indicate the need of a period for acclimatizing; and with these plant selection will help to bring them to a higher state of yield capacity. An ideal to give increased and improved

rice cultivations would be for the early plantings to be made with an upland type, that is intermediate between true lowland and so-called hill-land, such as Afiri, which is a close relative of Africa, or Mwanga or Bungala, with late plantings of an improved hill-land type such as Unyengwa; the two harvests would coincide as the latter type is of shortest "age" and loss through birds would thus be at a minimum; the general failure of the native rice crop would then be rare. Of the low-land types, Kanunge is outstanding and worthy of further investigation; it is the most popular rice of the delta, where conditions are more truly lowland. Maridadi, although regarded as an upland type appears to be more of a lowland character. In the interpretation of the results it must be remembered that proper spacing and careful cultivation in the trials tend to a higher yield with the lowland types and many upland varieties than would occur with the poorer cultivations followed by the native grower; and conversely, the hill-land and true upland types would be more outstanding under native conditions. Mention should be made of the introduced variety Pa D.C. which although described as a marsh-land type, proved suitable to drier land conditions, is heavy-bearing with a grain superior in appearance to that of the local kinds, and should by plant selection prove a valuable addition.

The great diversity of types of rice, mentioned above, considerably depresses the commercial value of the crop; the Deltal area has fewer types than the central valley, because of its peculiar conditions, and its rices have a premium of three per cent. over the other areas of the district, the product placed on the market by the local buyers being more uniform with less waste in milling. In the improvement of the rice crop no co-operation can be expected from the local buyer, who has not storage room for keeping separate the many kinds of rice he buys from the grower. The only solution is through the grower, and to eliminate what one may term the sentimental types it will be necessary to produce a rice which in addition to being of good quality, popular taste and capable of long storage must be of such high yield that a wide demand for its seed will follow demonstration in agricultural sub-stations and co-operative plots.

The rice trials have now reached the point where this can be attempted by single plant selection for the production of pure lines; and keeping the erratic rainfall of the coastal climate in view, the points leading to the choice of any single plant are:—

(a) To make the crop as independent of water supply as possible, by selecting plants, from upland and hill-land varieties, which show an unusual resistance to drought conditions, with early maturity.

(b) To ensure against seasons of heavy rainfall by the selection of strong-strawed plants.

(c) To select also for yield, long-keeping quality of grain and acceptable taste, which are imperative.

It is realised that rice can be acclimatized to suit any conditions within reason; and rice being a water-loving plant, it is obvious that the above requirements will be more easily met by selecting from upland and hill-land types. At the same time it may be possible to obtain an unusual plant from a marsh-land type which has the desired qualities, if it is widely

sought among native cultivations. As a beginning the following selections have been made of single plants from all the three main types in the trials of 1928:—

No. 1/28	Selection	from	Hebu.
No. 10/28	,,	,,	Almeri Mgeni.
No. 20/28	,,	,,	Komamanga.
No. 30/28	,,	,,	Unyengwa.
No. 40/28	,,	,,	Bungala.
No. 50/28	,,	,,	Mwanga.
No. 60/28	,,	,,	Pa D.C.
No. 70/28	,,	,,	Borakupata.
No. 80/28	,,	,,	Meno Meupe.

Over 100 selections were made, but after detailed examination all but the above were discarded, and of these the Mwanga, Bungala, Unyengwa and Almeri Mgeni are the most promising.

27. *Pulses.*—Introduced early maturing pulses were included for trial, the following notes being made:—

(a) Sugar Beans. This field bean from South Africa was sown at intervals from January to April; the germination was very poor, and it was only with difficulty that any growth was obtained. The plants which survived the dry periods were sickly and although they flowered, none produced seeding pods. It can be stated definitely that this crop is quite unsuited to coastal conditions.

(b) Tepary Bean. This crop held out good possibilities of drought resistance. Seed from Morogoro Agricultural Station was sown in March and yielded but 80lb. per acre as compared to 740lb. with green gram, 1,140lb. with cowpeas and 160lb. with Bonavist bean, all indigenous to the district. The seed of Tepary bean that was harvested was carefully stored and sown during the short rains in November and December; and two resowings were made but there was no germination. It would appear that the germination power cannot be retained by Tepary bean in the moist valley climate; this should be further investigated as if this can can be overcome the crop should be of value to the native agriculture of the district.

28. *Bulrush Millets.*—Local types of bulrush millets, which have a small grain, were sown for a second year in trial with the bolder-grained varieties of Tabora and Dodoma, with the following results:—

Variety	Comparative Yields.			
	1928		1927	
Dodoma	67	(III)	21	(VIII)
Tabora	100	(I)	—	
Mkula	71	(II)	85	(II)
Kisago	55	(V)	100	(I)
Lumbururu	42	(VII)	58	(VII)
Ruhonyo...	33	(IX)	61	(VI)
Kukwili	51	(VI)	71	(V)
Nyakihuki	64	(IV)	77	(IV)
Nyamatoti	36	(VIII)	80	(III)

Both the Dodoma and Tabora varieties matured twenty days earlier than the local types. These should be valuable introductions to the hill-lands, especially the more dwarf Tabora type. The Dodoma variety with its large thick head suffers badly from moulds in seasons of heavy rainfall, which accounts for its low yield in the 1927 season.

29. *Simsim.*—The simsim grown in the district is of mixed type with poor commercial value, and selections were made with a view to improvement in colour. The worked proved so complex that it could not be carried through without seriously interfering with other experimentation, and the more simple way of obtaining a good sample of white simsim from Lindi was followed for the 1929 season, from which it should be comparatively easy to obtain improvement by selection.

30. *Sorghum Millets.*—The indigenous sorghums, although hard-grained and so of good keeping qualities, require a period of 4 to 8 months for maturity; they also grow to a height of 10 to 15 feet, are very exhaustive to the soil, and are subject to smut. Three introduced early-maturing types resistant to smut were tried, one of them, Dwarf Hegari, having proved suitable in previous seasons; the germination of this and Dwarf Yellow Milo was poor and no seed was harvested. With Feterita sorghum, a new introduction with origin in the Sudan, a sowing on 13th January yielded 65lb. per acre, but with poor quality, mouldy grain; a second sowing on 14th March gave 155lb. per acre, but again although better than the first sowing, there were many blind ears due to moulds and the quality of the grain was poor. A third sowing made on 2nd June on a low-lying island in the river gave 360lb. of grain of excellent quality and no moulds were observed. It was found that the large soft grain rapidly became weevil-infested; and although Feterita should have good possibilities in drier areas, it is useless for introduction into native agriculture of low coastal districts. It may have considerable value for hybridising with a local variety, for the production of a type having early maturity, dwarfness and smut resistance combined with hardness of grain. A criticism that is often heard against quick-maturing types of all crops is that they are especially liable to losses by birds and monkeys; but this is avoided by planting later than the longer maturing kinds, when the harvests will coincide. Trials of local varieties were also carried out with the following results:—

Variety.	Comparative Yield.
Nokori	94 (III)
Mbangara	100 (I)
Jebesi	21 (VI)
Kibwe	86 (IV)
Kanga	100 (I)
Ndumyungu	43 (V)

31. *Maize.*—Trials of maize were carried out with Kenya hybrid, White Cango and two types of Potchefstroom Pearl. Plots of Kenya hybrid were damaged by elephant, and with Potchefstroom Pearl the

yields were insignificant on account of poor germination; the results of the trials are thus of no value.

32. *Seed Multiplication Plots.*—For the purpose of introduction into native agriculture and crop extension, the following crops were grown for seed multiplication:—

Crop.	Yield Per Acre.	Total Amount for Distribution.
	lb.	lb.
Maize, White Cango	755	8,729
Maize, Kenya hybrid	1,784	10,051
Bonavist Bean	228	870
Green Gram...	362	1,680
Millet, Dodoma	389	200
Millet, Tabora	428	107
Millet, Panicum	924	2,311
Groundnuts	321	1,161

33. *Cover Crops.*—Trial was continued with *Centrosema pubescens* and *Passiflora foetida*. The former again showed its unsuitability to local conditions, while *Passiflora foetida* again gave a thick growth impenetrable to weeds, and showed a high resistance to drought. Last season's planting was left to show the effects of a second year; with the short rains it quickly recovered and made heavy growth, but two years would appear to be the maximum effective growth of this plant. New sowings were also made, and these as in the previous years required careful weeding for one month until established; after this the crop was able to compete and smother all weed growth, including the sedge grass "dago," *Cyperus rotundus*, no weeding has been required over twelve months, and no weeds of any description becoming visible. The seed possess a hard glutinous coat, which requires soaking for 24 hours before sowing to obtain quick germination, or equally good results are obtained if freshly gathered berries, which contain several seeds, are sown direct.

A. J. Wakefield,
District Agricultural Officer.

IBADAKULI AGRICULTURAL STATION.

34. The area of the station was increased to 200 acres which were ploughed, cross-ploughed and harrowed. A temporary office was erected near the Overseer's quarters and a cattle boma was made near the nursery.

35. The trials begun last year were continued. The area of the plots was reduced to one-fortieth of an acre and planted in quadruplicate instead of being one-twentieth of an acre in duplicate. Plots showing more variations in the distances were added to the distance of sowing experiments.

36. In addition to the experimental plots propagative plots of Tepary bean, Virginia bunch variety of groundnuts, White Cango and Potchefstroom Pearl maize and simsim have been planted in order to obtain seed for distribution.

37. The following tables show the results of the first trials carried out at this Station. The deductions are based on the results of the experiments but, of course, cannot be taken as conclusive.

38. *Cotton: Time of Sowing:—*

Date of Planting	Rainfall in mm.	Yield per acre			Comparative
		1st Series	2nd Series	Average	
		lb.	lb.	lb.	
Dec. 22nd 1927 ...	Dec. 103.0	315	290	303	100
Jan. 10th 1928 ...		290	290	290	96
,, 25th 1928 ...	Jan. 88.0	220	195	208	69
Feb. 10th 1928 ...		200	200	200	66
,, 23rd 1928 ...	Feb. 183.0	190	140	165	54
Mar. 10th 1928 ...		105	90	98	32
,, 27th 1928 ...	Mar. 252.0	55	70	63	21

The results of this experiment indicate that early planted cotton gives the heaviest yield and that planting should cease by the middle of February. The above experiments are to be repeated with the first plantings beginning on 15th November.

39. *Cotton: Distance of Sowing.*—All plots were sown on the 22nd December. The distance between the rows was 3 feet.

Spacing in inches	Plants per hill	Comparative yields	
		1st Series	2nd Series
6	1	53	44
9	1	46	44
12	1	72	56
15	2	65	81
18	2	100	100
24	2	89	92

The above experiments indicate that the wider spacings with two plants per hill give the best results. 3 feet by 18 inches gave the best yield. Additional experiments are now in progress where the distance between the rows is 2 feet 6 inches and the spacings 6, 9, 12 and 24 inches.

40. *Maize: Comparative Trials.*—Trials were carried out with White Cango and Potchefstroom Pearl (A) and White Cango (B). The distance between the rows was 3 feet and the spacing 2 feet. The results in the Time of Planting series are shown together for comparison:—

Variety	Date of Planting	Days to Maturity	Rainfall in mm.	Yield per Acre	
				1st Series	2nd Series
				lb.	lb.
A	20-12-27	141	Dec. 103	1,440	1,380
B	,,	128		760	820
A	10-1-28	120	Jan. 88	1,400	1,400
B	,,	107		780	740
A	25-1-28	108		1,260	1,260
B	,,	104		760	660
A	10-2-28	102	Feb. 183	1,020	1,100
B	,,	88		620	660
A	23-2-28	99		840	740
B	,,	89		560	500
A	10-3-28	92	Mar. 252	480	580
B	,,	92		380	340
A	27-3-28	86		360	260
B	,,	86		260	180

From the results of the above experiments it appears that early-planted maize gives the best results. It would appear that Potchefstroom Pearl is more suited to this district than White Cango. No definite conclusion can be drawn from the first trials, which are being repeated.

41. *Maize: Distance of Sowing.*—In the following table the yields are shown for comparison between the two varieties:—

Variety	Spacing	Yield per Acre		Comparative Yield	
		1st Series	2nd Series	1st Series	2nd Series
		lb.	lb.		
Pot. Pearl	3′ × 2′	1,060	980	76	65
	3′ × 3′	1,220	1,380	87	92
	4′ × 1′	1,400	1,400	100	96
	4′ × 1½′	1,280	1,500	91	100
White Cango	3′ × 2′	420	460	78	74
	3′ × 3′	540	540	100	87
	4′ × 1′	480	620	89	100
	4′ × 1½′	420	560	78	90

It will be observed that Potchefstroom Pearl gave better yields than White Cango. The above experiments are to be repeated with additional plots 3 feet 6 inches between the rows and a spacing of 12 inches.

42. *Groundnuts: Time of Sowing.*—Virginia bunch variety was sown. The spacing kept was 30 inches between the rows and 9 inches between plants in the row.

Date of Planting	Days to Maturity	Yield	
		1st Series	2nd Series
		lb.	lb.
January 9th	96	840	780
January 26th	76	780	640
February 10th	65	860	820
February 23rd	81	900	980
March 10th	70	960	980
March 27th	92	720	560

From the above results it appears that groundnuts planted at the beginning of the heavy rains give the best results.

43. *Groundnuts: Distance of Sowing.*—All plots were planted on the 19th January, 1928.

Variety	Spacing	Yields per Acre			
		1st Series	2nd Series	3rd Series	4th Series
		lbs.	lbs.	lbs.	lbs.
Virginia bunch	30" x 9"	980	1,000	900	1,020
	42" x 9"	820	860	820	900

The above results indicate that the closer spacing gives the heavier yields.

44. *Sorghums and Millets: Variety Trials.*—Numerous varieties of sorghums and millets suited to semi-arid conditions have been tried. A summary of the results is as follows:—

Variety.	Days to Maturity.	Comparative Yield.
Western Golden Millet ...	55	2
Hungarian...	59	—
White Wonder	59	1
Gold Mine...	59	1
Dwarf Hegeri	131	46
Bonganhilo	195	55
Kilinyali	170	100
Dwarf Yellow	132	46
Feterita	108	41
Bulrush Millet	177	58
Panicum frumentaceum ...	91	4
Sudan Grass	142	17
Leoti Red Sorghum	144	3
Early Sumac	139	9
Black Amber	139	74
Freed Sorghum	144	3
Red Amber	136	23
White Milo	139	26

Of the varieties tried the local variety Kilinyali proved the best. It is hard-grained and it was the only variety which, when stored, resisted weevil.

45. *Soy Beans: Variety Trials.*—Eight varieties of Soy beans were tried. The experiments were a failure and no results were obtained.

46. *Fodder Crops.*—Old Man Saltbush, Creeping Saltbush and Upright Saltbush were sown but the seeds failed to germinate. The above were also planted in the nursery but no results were obtained.

47. *Dry-land Plants and Green Dressings.*—Trials are in progress with various varieties of grasses suited to semi-arid conditions. Karroo bush, subterranean clover and Berseem or Egyptian clover are also being tried.

48. *Nursery.*—Along the banks of the river one acre of ground has been prepared as a nursery. Various vegetables have been grown by the school children and all plants requiring special care are grown here. The following is a list of some of the plants and grasses grown:—

Tetragonia arbuscula, Karroo bush.
Tripteris leptoloba.
Sterculia diversifolia, Kurrajong.
Chrysanthemum cinerariaefolia, Pyrethrum.
Ceratonia Siliqua, Locust or Carob bean.
Texas Grass.
Warrego summer grass.
Native Millet, *Panicum decompositum.*
Giant panic.
Coolah grass.
Queensland grass.
Rare Blue grass.
Brown tapor sugar grass.
Weeping love grass.
Blue Mitchell grass.

A. S. Richardson,
District Agricultural Officer.

BOTANIC GARDENS, DAR ES SALAAM.

49. Progress has been fully maintained in the gardens, and the distribution of plants and seeds continues to increase. For 1928-29 this was as follows:—

Plants	Seeds (pkts.)	Cuttings (bundles)	Suckers	Bulbs (pkts.)
2,273	91	6	280	9

In addition 13lb. of Pithecolobium (for hedges) and 1½lb. of Cassia seed was distributed, and two Wardian cases of plants were taken to Kew by the Head Gardener.

50. Plant and seed introduction into the gardens was:—

Plants	Seeds (pkts.)	Cuttings
22	79	10

51. Further investigation of plants was carried out as also was planting for seed supplies; and the following notes refer.

52. *Cover Crops.—Calopogonium mucunoides.* This is one of the best cover crops tried here. Approximately 30lb. of the seed is available for distribution, and is being used for introducing this useful plant among planters.

Indigofera arrecta. A packet of this seed was received from the Moshi District where the plant is indigenous. The trial planting was made for observations on the plant under dry conditions and for seed supplies. The seed was sown at the opening of the big rainy season, and germination was poor. The plants grew tall and appeared drawn, and they did not flower.

Crotalaria recta. Seed of this plant was received from the District Agricultural Officer, Moshi, for trial as a green manure and cover crop, and for seed supplies. Germination was irregular, and subsequent growth poor, and the plants did not flower. Like the Indigofera mentioned above, it appears to be unsuited to the conditions of Dar es Salaam.

53. *Fodder Plants.—Crotalaria striata.* Seed was sown in March, 1928, and germination had begun within a week. As stated in the last Report, seed came originally from Ukara Island, Lake Victoria, where according to the District Agricultural Officer the plant is cut and used as fodder for stall-fed cattle on the island. This has since been confirmed independently by a District Officer of the Administration who has recently visited the island, but feeding trials carried out by the Veterinary Department in Dar es Salaam showed that cattle would not eat it. The plant

does extremely well in the low-lying coastal country and makes an excellent cover and green manure crop. Eighteen pounds of the seed was harvested.

Kudzu Vine. *Pueraria Thunbergiana.* Seed was received from South Africa and sown in early April. Germination was poor and all plants had died off by September. This plant is apparently of no value in the low country.

Karroo bush, *Tetragonia arbuscula.* Seeds were received from South Africa and these germinated ten days from sowing. The resultant seed from the plants has been resown for further seed supplies.

Common sheep bush, *Pentzia incana.* Seeds were received from South Africa and no germination resulted. Fresh seed is being obtained.

54. *Fibre Plants.—Hibiscus Sabdariffa* var. *altissima* (red). The seeds were sown in March, and germinated well within a week, and subsequent growth was good and uniform. The seedlings in rows were thinned to about six inches. The first flowers appeared on 20th June and seeds were harvested on 18th July. Three bundles each of one hundred stems were cut and retted and the following figures refer:—

Bundle Number.	Average length, of stems when cut.	Weight lb.	Average length of dried fibre.	Weight of dried fibre, oz.
1	5′ to 5′ 3″	25	5′	13
2	4′ 9″	19	4′ 6″	9½
3	5′	21	5′	9¼

The bundles were dried for three days and retted for twelve days, the fibre then being dried and bleached in the sun.

The same cultural remarks apply to the green variety. Germination was good but subsequent growth was poor and the stand irregular. Only two bundles of one hundred each of stems were cut, and owing to the poor growth made by this variety average height at the time of harvesting was only three to three-and-a-half feet. The bundles were retted for ten days and the following are the tabulated results:—

Bundle Number	Average length of stems when cut	Weight	Average length of dried fibre	Weight of dried fibre
1	4′	4 lb.	3′ to 3′ 3″	6 oz.
2	4′	3¾ lb.	3′	5 oz

Hibiscus cannabinus. This particular variety is tall-growing with deep violet flowers and straight stems, and is to be found growing in the swamp soils near Ruvu. Germination and subsequent growth were good, the plants reaching to an average height of six feet. Only a small number had heavy-branching systems. Three bundles of the stems were cut for fibre trials, two of one hundred stems each and one bundle of seventy-five stems. The bundles were dried for four days and retted for nineteen days. The lengthy period was due to be partial drying up of the river during the first fourteen days of retting. The following figures refer:—

Bundle Number	Average length when cut	Weight	Average length of dried fibre	Weight of dried fibre
1	5′ 9″ to 6′	11 lb.	2′ 9″ to 3′	5 oz.
2	5′ 6″ to 6′	11½ lb.	2′ 6″ to 3′	5 oz.
3. 75 Stems only	6′ to 6′ 6″	11½ lb.	2′ 9″ to 3′	6 oz.

Hibiscus cannabinus. Type 3 from Pusa. Germination was not good. Subsequent growth was fair, but the majority of the plants were stunted. Two bundles, each of one hundred stems were cut, dried and retted.

Bundle Number	Average length of stems when cut	Weight	Average length of dried fibre	Weight of dried fibre
1	4′ 6″ to 5′	20½ lb.	3′ 6″ to 4	5¾ oz.
2	3′ 6″ to 4′	10½ lb.	2′ to 2′ 3″	3¾ oz.

Hibiscus cannabinus. This seed was selected from unbranched plants of the local type and was sown for further observation and selection. Germination was good. Elimination of plants with branching habits was done during July and August.

Owing to the effect on results of the unfavourable season which also caused poor retting through the drying up of the water supply, the sending of the fibres to the Imperial Institute for report was omitted this year.

Chinese Jute, *Abutilon Avicennae.* A small packet of seeds was received from Turkestan and increased for trial.

Sunn Hemp, *Crotalaria Juncea.* This has been proved of no use as a fibre plant in the coastal area, the plants generally being stunted and the fibre obtained from them being of no use. All available seed was collected.

55. *Other Plants.—Vigna marima.* All seed harvested from the previous season was sown for futher seed supplies. Germination was fair and for a time very little growth was made, but with the showers in June

the plants put out runners. The first flowers appeared early in September and the plants subsequently made rapid growth. The plant apparently seeds when other bean crops are scarce and on this account it may be of great use in native agriculture, especially as it is closely related to the cowpea ("kunde") a food of first importance in the Territory. Trials with this end in view and on a larger scale are being made.

56. *Plant and Seed Introductions.*—These numbered 108, of which 26 were food crops, 39 other economic crops, 11 fodder and 32 decorative. Most of the above were introduced in fairly large quantities, as for instance that of *Aleurites Fordii* for the beginning of a new industry in the Southern Highlands, and 150lb. of sugar-beet seed for trial in the Songea District. The fodder crop seeds were from the semi-arid regions of the world and are being tried under the semi-arid conditions of parts of the Territory.

57. *General Matters.*—As in previous years, the maintenance of Government House Grounds, and the care and planting of avenue trees is under the supervision of the Head Gardener. Trees of all kinds taken down in Dar es Salaam for various reasons numbered 665. A number of avenues have been planted with *Peltophorum ferrugineum* to replace existing trees of *Albizzia Lebbek*. Open spaces in the town have been laid out and planted up and are a welcome increase of its amenities. The upkeep of the war graves has continued throughout the year. There is no further improvement in the conditions of coconut plantations generally, in and near Dar es Salaam, most owners being satisfied with such cultivation and plantation sanitation as is enforced by the coconut regulations.
The first-order meteorological station has been fully maintained, weekly and monthly returns being rendered.

58. *Plant Importations through Dar es Salaam.*—The Head Gardener continued to act as Plant Import Inspector and the disposal of consignments inspected was as under:—

Total inspected.	Passed for importation.	Rejected.
141	110	31

T. H. Marshall,
Head Gardener.

ENTOMOLOGICAL WORK.

59. *Work with Mulberry Silkworms.*—Two rearings with eggs of French origin were carried out at the Entomological Laboratory, Morogoro, in 1928 under the following conditions:—

	Date of arrival of eggs at Dar es Salaam (1)	Date of Hatching of eggs (2)	Mean Minimum temperature Centigrade (3)	Mean Maximum temperature Centigrade (4)	Mean Humidity at 9 am. (5)	Mean Humidity at 2 pm. (6)	No. of days on which rain fell (7)	Total Precipitation during period (8)
A.	20/3/28	2/4/28	19.6	27.8	87	67	29	288.1 mm
B.	20/5/28	1/7/28	12.9	27.0	73	46	64	0.5 mm

Note (1) (A) Eggs were received at Dar es Salaam and immediately were brought to Morogoro and maintained by means of ice supplies at 0·5 Centigrade pending suitability of leaf-supply.

(B) Eggs were received at Dar es Salaam and placed in cold storage there pending suitability of leaf-supply.

Note (2) In both instances hatching was even, strong and complete.

Note (3) to (8) Meteorological data is based on observations for 42 days dating from hatching date.

Note (5) & (6) Humidity determined from wet and dry bulb thermometers.

The most noteworthy feature of the rearings has been the irregular and prolonged development period varying from 28 to 42 days in the rearing (A) and from 35 to 50 days in the rearing (B). The extreme variation in the size of the worms became outstanding early in the period, and at 40 to 50 days, worms not over 15mm. were still to be found. In rearing (A), the extreme variation in sizes and skin pattern and tardiness in development was the most pronounced in the Croisements Polyjaunes, races jaunes de France which it was first necessary to reduce in numbers and later to discard as flacherie and grasserie set in. Rearing (B) was of one race only selected on the result of rearing (A) (Croisement Chinois, femelle doré Chinoise x male jaune Français). The development was again very slow and grasserie serious in the mounting worms. The cocoons in both rearings were extremely mixed in type and not true to colour.

60. *Silkworm Diseases.*—Grasserie was the major disease in both rearings. In the initial rearing the onset was observed when worms were full grown and ready to mount. In the second an occasional worm in the third instar showed a greasy grasserie appearance with yellow exudate and these may have been the forerunners to the later incidence on the mature worms. In the first rearing the humid conditions would decidedly favour the disease, but the weather conditions during the second rearing were considered favourable and food was ample, regular, and of

chosen quality. The worms occupied as much as 540 square feet of tray-space, but the incidence was destructively high.

Flacherie appeared in both rearings: in the first early (3rd and 4th instar) especially in the French White Crosses which showed a decided slow, irregular and weakly development. They were extremely mixed and very early discarded; the typical symptom was a black and most infectious vomit. The disease was general in spinning worms of the first rearing, leading to soiling of many fine cocoons by the foul-smelling black decomposing worms in the spinning bush. In the second rearing it was extremely rare and occurred in the last instar, taking the form of an intestinal stoppage through undigested materials and dark body-discoloration.

Muscardine was observed in all instars of the first rearing and was attributable to the humid conditions. The behaviour of the disease was typical. The onset was characterised by a brownish-red to red pallor of the body, later followed by a general hardening or rigor. The worms covered externally with the white sporulating fungus are readily detected. Only one instance of muscardine was observed in the second rearing, the prevailing weather conditions being distinctly against development of diseases of this nature.

Given a favourable rearing period it is indicated that diseases of the nature of muscardine and flacherie are of a low incidence, but the higher incidence of grasserie calls for study in its relation to (a) moisture content of food-material, and (b) temperature and ventilation control in the rearing houses. The provision of buildings and apparatus to permit of this industry in Tanganyika being a self-contained one is a necessity as it is clear from the results of the past year that reliance for egg production on firms abroad is unsatisfactory and that study of races and crossings under the average conditions of the Territory will constitute a most important line of work—having in view the production and maintenance of a Territory race of quick-maturity and hardy constitution.

61. *Varieties of Mulberry.*—*Morus indica* and *M. alba* were planted extensively in the Territory during the German regime and there is ample propagative material available in most districts. *M. indica* is extremely hardy even under most adverse conditions and comes again rapidly when cut back for feeding purposes. If well fertilised and watered it would provide such a succession of food supplies as is requisite for maintenance of polyvoltine races. The quality of leaf is satisfactory and the initial report on the 1926 cocoons is indicative that the silk produced is of excellent quality. It is adapted to bush and hedgerow culture. *M. alba* when set out in the field rapidly makes a growth of from 10 feet to 20 feet in height and a branch spread of from 5 to 8 feet. The number of flushes (food supplies) is naturally dependent on prevailing rainfall, but at least three may be procured where reliance is placed on rainfall alone, and an almost indefinite number where irrigation is available.

Seed of *M. latifolia* was received from the School of Silk Industry, Ling Nan University, Canton, and the plants established have done exceptionally well.

With reference to field establishment of mulberry for silk industry, field observation in the Territory shows that progress of seedlings is slow and that establishment is better done with well-rooted cuttings set out in the November or short rains. Poorly-rooted plants are rapidly attacked by termites, pests which also render the establishment of standard trees difficult. The latter should preferably be from $1\frac{3}{4}$ to 2 inches in diameter headed to from 3 to 3 feet 6 inches at time of field planting and carefully watered till sap flow is thoroughly renewed. Plants to be grown in bush form should be not closer than 5 feet in both planting directions and in standard form 15 feet.

62. *Mulberry Pests.*—The scale insect *Diaspis pentagona* which according to French and Italian literature is a destructive pest in European mulberry fields has not been recorded in the Territory. A species of Icerya (? aegyptiaca) has been observed attacking the hedge mulberry, *M. indica*, L. The plants become completely whitened in a dense covering of the scale, and when no action is taken are killed back to the root stock. The lamiid beetle, *Inesida leprosa*, Fab. breeds in old neglected mulberry plants. The grubs are to be found in the old hard stems and stocks, but when mulberry is given attention there is little likelihood of this borer becoming serious. A prolific source of this insect is the extensively neglected areas of Ceara rubber throughout the Territory in which it finds unlimited material for uninterrupted propagation. Various grasshoppers and weevils *(Systates* spp.) are to be found occasionally on mulberry foliage but so far not to any serious extent.

63. *Mulberry Pests.*—Mulberry foliage is attacked during the more humid seasons of the year by leaf mildew, *Ovulariopsis moricola*, described by Delacroix from Madagascar. Crowding of bush in densely planted rows in an endeavour to procure high leaf production per acre is thus to be condemned. Plants should be well-spaced and thinned out as the prevailing conditions of respective districts demand, to ensure thorough ventilation of the plantation. Another reason for this is that leaf from overcrowded plantations contains less solid nutritional matter and is liable to produce cocoons less rich in silk. An application of a weak Bordeaux mixture (2:2:40) after pruning has proved of benefit. Certain types of mulberry are observed to be immune from attack while others are more prone.

The well-known disease called blight caused by *Bacterium mori*, Boyer and Lambert (detd. Doidge), occurs on the mulberry formerly planted in the district and has also appeared on the newly planted-out French stock. A description and illustration of the disease is given in the *Annals of Applied Biology*, Vol. II, pp. 113-124, and in *Bacterial Diseases of Plants*, pp. 340-358. So far the disease has not affected the experimental plantation to any serious extent. The remedy advised is to cut back stems and branches attacked well below the lowest evidences of attack and immediately to collect and burn the diseased materials.

64. *Bee-keeping.*—The export of beeswax for 1928 was 9,815 cwts. that of the first nine months of the year showing an increase of 551 cwts.

in quantity and £2,508 in value over the corresponding figures for 1927; the anticipated increase in the total export of the year was not however realised. Exports for the years and ports shown have been as follows: —

	1926	1927	1928	1926	1927	1928
	Cwts.	Cwts.	Cwts.	£	£	£
Dar es Salaam...	3,834	9,821	8,185	30,143	71,212	59,793
Mwanza	183	454	*262	1,260	3,177	1,783
Lindi	1,921	855	1,169	15,206	6,176	8,155
Tanga	49	12	59	388	98	420
Kilwa	157	13	128	1,166	93	857
Other Stations...	3	14	12	16	107	71
TOTALS ...	6,147	11,169	9,815	48,179	80,863	71,079

* NOTE.—In comparing the 1927 and 1928 Mwanza figures, add 160 cwts. shipped through to Dar es Salaam by the new Tabora-Mwanza railroad. The new railroad handled 24·5 tons of wax during the year.

The monthly price for best Tabora beeswax at Dar es Salaam has varied from Shs. 42/50 to Shs. 47/- per frasila of 16 kgms., with wax from other districts Cts. 75 to Shs. 1 50 per frasila less according to quality, the Iringa product being about the lowest in price.

The interest and trade in beeswax are satisfactory in the Territory generally with the exception of the Northern Province where the total export amounts to only 6 cwts. There is a considerable bee-keeping industry in the Province, however, for the supply of honey at highly remunerative prices for beer-brewing; and it is hoped that some circumstance in native trade may arise to necessitate attention to this at present discarded by-product.

65. *Coffee Pests.*—The rainfall in the northern districts of the Territory fell to one-tenth of the normal in the early months of 1929 and coffee was seriously affected by thrips, *Physothrips xanthoceros*, Hood, which spread unusually to the uppermost limits of the crop (over 5,000 feet). Lime-sulphur (1 in 40) was in general use but procrastination in the hope for rain caused in several plantations very severe loss. The use of a "Headland" hand sprayer and a motor sprayer with two and four hundred feet leads of hose respectively (capacity 1,500 to 3,000 trees per day) has been demonstrated to planters with a view to the supplanting by such outfits of knapsack compression sprayers and to permitting more expeditious spraying on occasions of rapid onset of thrips. There is evidence to show that an early spraying of lime-sulphur in late December or January has a prophylactic effect against spread of thrips. Work toward improvement of the spreading and sticking properties of lime-sulphur and trial of substitute sprays against thrips is under way; and a Bordeaux mixture—oil emulsion spray is also being tried in view of the

results claimed for pre-monsoon use of Bordeaux mixture against leaf-disease in Mysore. The dry weather was also conducive to an undue prevalence of green scale. *Lecanium viride*, Green, and two sprayings at a ten-day interval of lime-sulphur (1 in 15) were necessary to effect control. Two species of micro-hymenoptera were parasitising the scale but predators (Coccinellids, etc.) were few in number. The potency of the fungus *Cephalosporium lecanii* is realised when weather conditions are against its effective functioning.

The coffee bug, *Antestia lineaticollis*, St., has caused considerable loss to the current crop especially on plantations where spraying (with sweetened arsenite of soda) was omitted in the drier pre-rain period January-February. An improvement in the method of control in the post-rain season is under consideration as results of spraying when ripening cherry is on the bushes in quantity are less satisfactory. Whether antestia damage consists of a purely mechanical injury to growing tips (witches' broom, wither-tip, etc.) and cherry (black bean, etc.), or the antestia is the transmitting agent of definite disease organisms, is a question which current experience shows to demand closer investigation. The falling of one-half to three-quarters of the coffee bean, as distinguished from small bean-fall due to thrips, has been more serious and noticeable with the dry weather; but all bean examined showed distinct evidence of puncturing by antestia while the stem and blossom ends of such bean showed no trace whatever of disease.

In the northern coffee districts the local mealy-bugs, *Ferrisia virgatus*, Ckll., and *Pseudococcus perniciosus*, Newst. and Willc., have been observed on several plantations; but *Pseudococcus lilacinus*, Ckll., the Kenya species, has not so far been found. The bean borer, *Stephanodores hampei*, Ferr., has also not come to attention. On the mealy-bugs the predatorial caterpillars of *Eublemma costimacula*, Saalm., are proving most effective in the work of natural control.

66. *Cotton Pests.*—The general low incidence of insect pests on cotton was reflected in the quantity and most noticeably in the quality of the year's crop—the cleanest on record. Weather conditions were such as to promote a quickly maturing July-August crop ahead of the season of the high incidence of red stainers, the number of which had been adversely influenced by the late appearance of the season rains and unduly low July temperatures. The incidence of pink boll-worm, *Platyedra gossypiella*, Saund., averaged at close of season only eight per cent. of locules of bolls with incidence per locule also low.

67. *Locusts.*—During the period March to May small swarms of the Desert Locust, *Schistocerca gregaria*, Forsk. (syn. *S. peregrina*, Ob.) appeared across the northern boundary of the Territory in the Mwanza (Kisesa, Magu, Ukerewe), Kilimanjaro (Moshi), and Pare (Hedaru, Kiruru, Lembeni) Districts. The swarms were of the sexually mature yellow form. Only minor injury to bean and cotton foliage was recorded.

In late November and early December, the Territory was again invaded along its northern border by yellow locusts, the greatest concentration

occurring in the South Pare District at Makanya. Various smaller groups separate from the main body which entered the Territory through the Himo gap between the Kilimanjaro and North Pare drifted southward to the Central area. Egg-laying was confined to two points however: Makanya, 2,210 feet., and Ngare ol Motoni (West Arusha), 5,000 feet. In the Makanya area it occurred in varying intensity over approximately 60 square miles. The nature of the country affected was such (overgrown sisal, sanseviera and thorn thicket) that hand-beating of the newly-emerged hoppers and driving of the later stages into dry bush and grass and firing were found to be the only practicable and effective methods of destruction. The minimum egg stage was fourteen days and the development period of hoppers forty-five days. In the Ngare ol Motoni area oviposition occurred in an extremely small garden patch and adjoining newly-planted coffee. The egg period was there twenty-two days and weather conditions were such that only a few straggling hoppers emerged. No winged locusts resulted from either oviposition. The outstanding entomological feature in both areas was the immediate effective control exercised by the fly predator, *Stomatorhina lunata*, F. The damage by this invasion was again trivial. The third and most serious locust visitation commenced on the 24th and 25th January when dense swarms of red locusts (immature phase) flew south across the northern boundary, the principal routes being in the gaps of the northern mountain chain, again: particularly the Himo gap referred to above. The red phase lasted for two months and locusts were showing colour-change to the yellow sexually mature phase at completion of the period of this Report.

Damage to crops initially viewed as serious, particularly by those of limited experience in tropical agriculture, is now valuated as surprisingly low considering the density of invasion. Indeed, compared with a West Indian hurricane, a locust visitation of the nature of that just described may be viewed as a very mild happening in the agricultural world.

68. *Legislation against Pests.*—The Plant Pest and Disease (Coffee) Regulations (under the Plant Pest and Disease Ordinance, 1921), and the Destruction of Locusts Ordinance, 1929, were published. The Plant Pest and Disease (Kapok) Regulations were presented in draft form for consideration and the Plant Pest and Disease (Plantations) Regulations are in preparation.

69. *Collections.*—The reference collection now comprises 1,500 specie identified by the Imperial Bureau of Entomology.

ARCHIBALD H. RITCHIE,
Entomologist.

MYCOLOGICAL WORK.

70. *Diseases of Cotton.*—The survey and investigation of cotton diseases, begun in 1927, was continued during the year in the Morogoro and Tabora-Mwanza areas. In addition to the fungi and diseases mentioned in the previous report, four others were observed: Violet Root disease (*Rhizoctonia crocorum* (Pers.) D.C.), a leaf-spot caused by an incompletely identified species of Ascochyta, a *Diplodina* sp. found once on unhealthy plants, and *Gibberella moniliforme*, Winch. (conidial stage), found once in open bolls. Of all the vegetable parasites found in cotton, only seven are considered of importance. Of these seven only three were observed in Tabora and Mwanza: *Bacterium malvacearum*, E.F.S., *Nematospora Gossypii*, A. and N., and *Mycosphaerella gossypina* (Atk.) Earle. The other three not encountered in that area are: *Ramularia areola*, Atk., *Ascochyta* sp., *Kuehneola Gossypii*, Arthur, and *R. crocorum* (Pers.), D.C. Of these seven parasites the first two are of most importance, while the last is potentially destructive under certain conditions. The other four cause leaf-spots, the effect of which is difficult to estimate, but may be considerable. Sufficient information has been obtained for the early publication of descriptions and control of these fungi and diseases.

71. *Diseases of Sisal.*—The fungi already recorded from sisal were observed frequently, and in addition several not yet fully identified were observed during a survey in January, 1929. Fungi however play a small part in the diseases of this crop; they are an indication more than the cause of disease, being essentially saprophytes or weak parasites on it. The diseases encountered were physiological in origin, due to environmental or climatic conditions, though fungi frequently followed. "Sun-scorch" is the most widespread and destructive; it was common on many plantations during the dry months in 1928. Manurial experiments are being formulated with the ultimate object of increasing the resistance of the plants under conditions which favour the appearance of this trouble.

A disease, which was observed on two plantations, was clearly due, in the first place, to the presence in the soil of excessive water. Until research can show the particular factors, whether they be soil acidity, lack of aeration in the soil, or others, the disease may well be referred to provisionally as "Waterlogging Disease." The external symptoms are the appearance of blue-black spots or streaks, always appearing first at the base of leaves. Gradually the dark areas cover the entire breadth of the affected leaf bases, and the leaf bends, and blackens all over. Unless conditions become normal, the entire base rots with an offensive odour. This disease, like sun-scorch, is the cause of considerable loss of fibre; but the present trouble appears fortunately to be very restricted in its distribution. Drainage to prevent stagnant water over long periods is the obvious method of control, though this may be economically inadvisable, or quite impossible due to the configuration of the ground.

Considerable areas of sisal have the leaves yellowish in colour, and soft, because of excess of soil moisture. This is a chronic condition, and not to be confused with the much more acute waterlogging disease.

Still another undesirable effect on sisal of much soil-moisture has been occasionally observed. In this case cut leaves left out in the field, exposed to the influence of the sun, rapidly whiten, dry, and become leathery, either in isolated spots or through all the tissues. In an intermediate stage partially dried leaves are lighter and involve less transport; This advantage is however offset by damage to such leaves in decortication, and by some undesirable colour in the fibre. Under such conditions the cut leaves are best hurried to the factory, and not left exposed during sunshine. Drainage where practical may be advisable in this case also.

72. *Diseases of Coffee.*—The diseases referred to in the previous Annual Report were frequently reported. A pamphlet, Number 1, has been issued by the Department, entitled "Diseases of Coffee," based on the observations already recorded. The fungus *Rhizoctonia bataticola* (Tanb.), Butl., has been confirmed from the roots of coffee suffering from root disease. No other fungi of economic importance have been noted on coffee during the year.

73. *Fungi on other cultivated plants.*—Other fungi collected in the Territory during the past year and identified at the Imperial Bureau of Mycology, Kew, are: on Sorghum: *Trichothecium roseum* (Pers.) Link., *Cladosporium herbarum* (Pers.) Link., and another species of Cladosporium, *Gibberella moniliforme* Winel. (conidia), *Fusarium* sp., *Rhinotrichum cucumerinum* Berk. and Curt.,—this fungus has been recorded only once before, on maize, *Alternaria tennis* Nees, *Phoma insidiosa Tassi*, *Choanephora* sp., *Acrothecium lunatum* Wakker. These fungi were all recorded from one small area of sorghum, and were in addition to the smuts and rust, already recorded. They are together quite destructive to the crop. As they are encouraged by damp or enclosure, their attack should be very largely or entirely prevented by avoiding such conditions.

On *Morus alba: Ovulariopsis moricola* Del., causing leaf-spot. There is a loss in silk from silkworms fed on affected leaves. Cutting the leaves early and avoiding damp conditions are the only practicable methods of control.

On *Cajanus indicus: Oidiopsis taurica* (Lev.) Salm. This powdery mildew is known on other legumes, but has not previously been recorded on this host. *Cercospora Cajani* P. Henn., leaf-spot. On *Ananas sativus: Thielaviopsis paradoxa* (de Seynes) von Höhn. On *Phaseolus radiatus:* the mildew, *Erisiphe polygoni* D.C. On *Saccharum officinale: Cercospora longipes* Butl., leaf-spot. On *Lushingtonia filifera: Pestalozzia versicolor* Speg., probably saprophytic. On *Rosa* sp.: *P. versicolor* Speg., probably saprophytic.

G. B. Wallace,
Mycologist.